

## CARPARK ENERGY SAVE PACKAGE

Carbon monoxide (CO) concentrations are measured in the carpark and fed directly into Rototech speed controller package. When CO concentrations are low (which is most of the time) the CPE controller slows down the exhaust fan motor. The end result is that you still comply with Australian standards but save big \$\$ on your power bill. The package is easy to install, IP66 water and dust resistant and low maintenance. The CPE package also includes a simple fire override input (no additional charge) if emergency smoke exhaust is required.



### Applications

- vehicle exhaust in parking structures (e.g. underground garages)
- engine repair shops
- tunnels
- equipment rooms
- ventilation systems etc.



### Features

- **Electrochemical sensor element**
- **4-20 mA or 2-10 Vdc output**
- **Wide supply voltage range (18-28 Vdc)**
- **Overload and short circuit protected**
- **Reverse polarity protected**
- **Continuous monitoring**
- **Low zero point drift**
- **Positioning stable**
- **Long life sensor**
- **Modular plug-in technology**

### Intended Use

The CO detector 4-20 mA / 2- 10 Vdc output is used for the continuous monitoring of the ambient air to detect the presence of carbon monoxide (CO) gas concentrations within the ambient conditions defined in the specifications.

Main application ranges for carbon monoxide detectors are underground car parks, tunnels, engine test stations, shelters, loading areas etc.

The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial ranges as well as small enterprises (according to EN50 082).

The CO detector must not be used in potentially explosive atmospheres.

**Technical data**

<b>Sensor element</b>	Electrochemical, diffusion
<b>Output</b>	4-20 mA, load < 500 ohm, 2-10 Vdc, load < 50 Kohm, overload and short circuit proof
<b>Power supply</b>	18-28 Vdc, (reverse polarity protected)
<b>Power consumption</b>	22 mA, max. (0.6 VA)
<b>Accuracy</b>	+/- 3 ppm
<b>Repeatability</b>	+/- 3% of reading
<b>Long term output drift</b>	< 5% signal loss/year
<b>Response time</b>	t90 < 50 seconds
<b>Sensor life expectancy</b>	5 years, normal operation environment
<b>Mounting height</b>	1.5 to 1.8 m above floor
<b>Humidity range</b>	15 to 90% non-condensing
<b>Temperature range</b>	Working: -10 to +50°C Storage: +5 to +50°C
<b>Pressure range</b>	Atmospheric ± 10%
<b>Enclosure color</b>	RAL 7032 (light grey)
<b>Installation</b>	Wall mounting
<b>CE-approval</b>	EMC_Directive 2004/1008/EEC, CE
<b>Enclosure/Protection</b>	
<b>CMA</b>	Plastic, Polycarbonate, IP65
<b>CMK</b>	Plastic, Polycarbonate, IP65 for duct
<b>Dimensions</b>	
<b>CMA</b>	H130 x W94 x D57 mm
<b>CMK</b>	H130 x W94 x D57 mm

**CMA wall types:**

**Sensor coverage** 400 m2 to 500 m2 (recommended)

**Mounting height** 1.5 to 1.8 m above floor


**CMA**
**CMK duct type**

**Gas inlet** Via a sampling pipe/  
connection tube

**Flow speed** Min. 5000 m/h,  
Max. 20,000 m/h

**Duct diameter (ca.)** Min. 0.1 m, max. 1.0 m

**Length of sampling pipe** 250 mm,  
adaptable to the duct diameter  
by cutting to lengths:  
192, 133 or 77 mm

**Tube length** 2 x 1000 mm

**Mounting** Arrow at the sampling set  
in flow direction.  
Always mount in the middle  
of the duct.  
Keep a minimum distance of  
1000 mm to duct bends etc.


**CMK**

## Ordering

Type no.	ppm range	Enclosure
<b>CMA 150VC</b>	0-150 ppm	IP65
<b>CMA 300VC</b>	0-300 ppm	IP65
<b>CMA 500VC</b>	0-500 ppm	IP65
<b>CMA 1000VC</b>	0-1000 ppm	IP65



CMA

<b>CMK 150VC</b>	0-150 ppm	IP65, duct
<b>CMK 300VC</b>	0-300 ppm	IP65, duct
<b>CMK 500VC</b>	0-500 ppm	IP65, duct
<b>CMK 1000VC</b>	0-1000 ppm	IP65, duct



CMK

Other ranges of PPM available on request

### Important notes before ordering:

CMA and CMK are manufactured on request.

As the storage life for CMA and CMK is up to 6 months unpowered we need pre-payment before process the order, this to avoid any cancellation of order.

Delivery time is normally 6 weeks after receipt of order.

## Functional Description

The sensor portion of the transmitter is a micro-fuel cell, which is completely sealed.

The ambient air to be monitored diffuses through a membrane filter into the liquid electrolyte of the sensor.

The chemical process of the measurement is one of oxidation where one molecule of the target gas is exchanged for one molecule of oxygen.

The reaction drives the oxygen molecule to the counter electrode, generating a current signal (nA) between the two electrodes.

This signal is linear to the volume concentration of the sensed gas.

The signal is evaluated by the connected amplifier and transformed into a linear 4-20 mA / 2-10 Vdc output signal.

Electrochemical processes always lead by-and-by to a loss of sensitivity.

Therefore regular calibration of zero-point and gain with the potentiometers Zero and Gain is necessary.

There is a small quantity of corrosive liquid in the sensor element. If in case of damage persons or objects touch the liquid, you have to clean the affected areas as fast and carefully as possible with tap water.

Out of use sensors must be disposed in the same way as batteries.

Silicon leads to an undesirable chemical reaction in the sensor and so causes a drift of the zero-point to the positive side.

Prolonged exposure leads to an important reduction of the sensor sensibility.

After exposure to silicone the sensor has to be replaced in order to provide for the functional reliability furthermore.

Electronics can be destroyed by static electricity.

Therefore, do not touch the equipment without a wrist strap connected to ground or without standing on a conductive floor (acc. to EN 61340-5-1).

## Mounting Instructions

When choosing the mounting site please pay attention to the following:

The specific weight of carbon monoxide CO is lower than that of air (factor 0.967).

Recommended mounting height is 1.5 m (5 feet) to 1.8 m (6 feet) above floor.

Choose mounting location of the unit according to local regulations.

Consider the ventilation conditions! Do not mount the unit in the centre of the airflow (air passages, suction holes).

Mount the unit at a location with minimum vibration and minimum variation in temperature (avoid direct sunlight).

Avoid locations where water, oil etc. may influence proper operation and where mechanical damage might be possible.

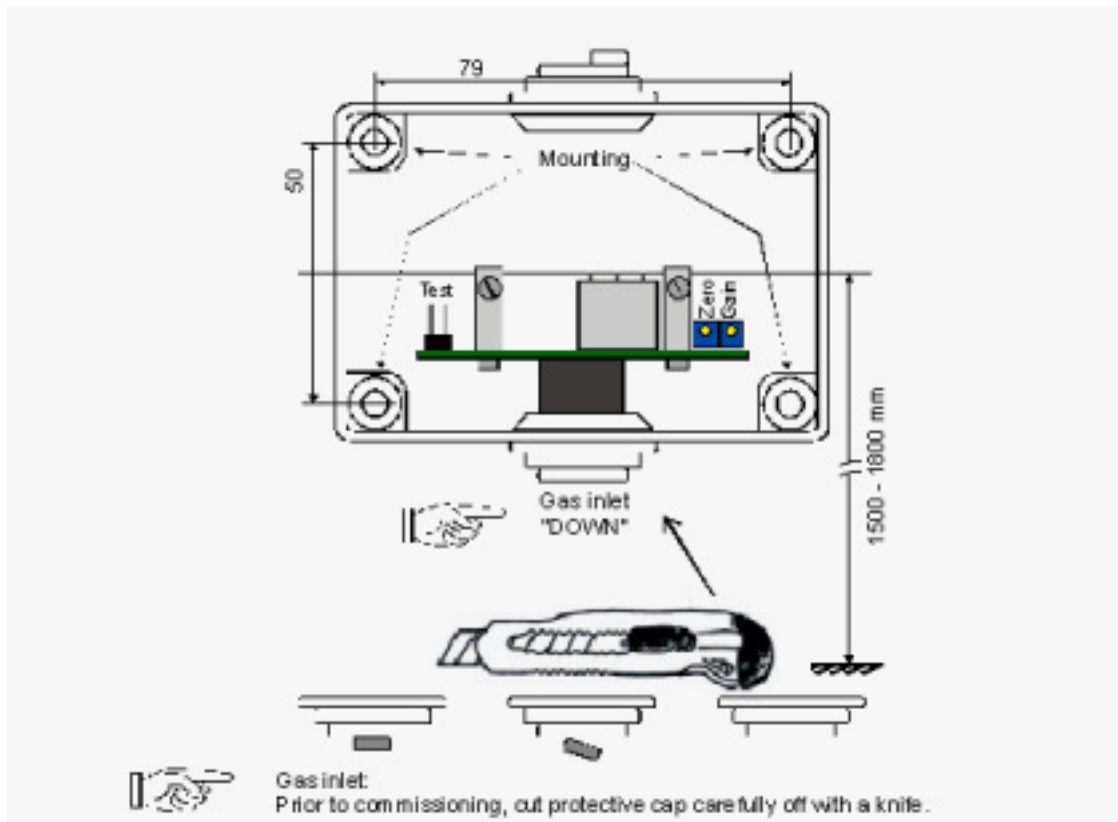
Provide adequate space around the unit for maintenance and calibration work.

## Installation

Open cover of enclosure.

Fix the enclosure by the 2 screws (gas inlet to the ground).

Replace the cover.



### Electrical Connection

Installation of the electrical wiring should only be performed by a trained specialist according to the connection diagram, without any power applied to conductors and according to the corresponding regulations!

Avoid any influence of external interference by using a shielded cable.

Recommended cable: J-Y(St)Y 2x2x0.8LG (18 AWG), maximum resistance 73 W/1000 m (20.8 W/1000 ft)  
When the PCB is mounted, it is important to ensure that the wire shields or any bare wires do not short the PCB.

### Wiring Connection

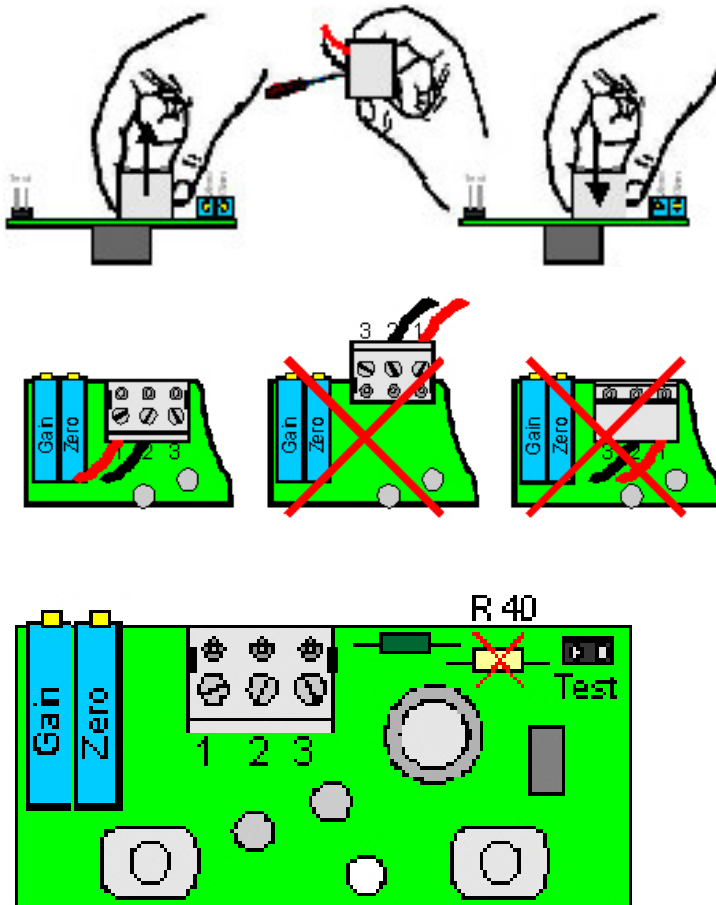
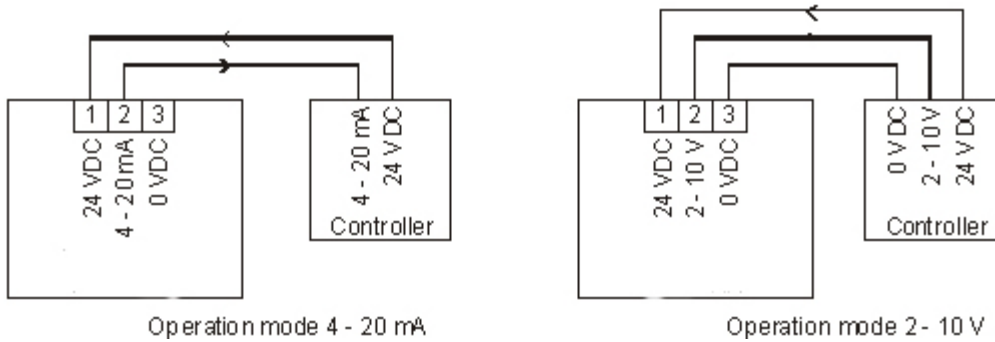
Open cover of enclosure.

Insert cable and strip it off.

Remove triple-pole socket board and connect the cable according to the wiring diagram.

Replug the socket board correctly at the multi-pin connector.

Close the cover.



Operation mode 4-20 mA (loop):  
The transmitter is always current source.  
Only 2-wire connection.

Operation mode 2-10 Vdc:  
**Remove R40 by using a wire cutter.**  
Always 3-wire connection.

Power supply  
24 Vdc (18-28 Vdc)  
for both 4-20 mA output and 2-10 Vdc output.

Wire connection  
screw type terminal  
min 24 AWG (0.25 mm<sup>2</sup>) and  
max 14 AWG (2.5 mm<sup>2</sup>)

Wire distance:  
Max. loop resist. 500 W  
(= wire resistor + controller input resistor)

## Commissioning

CO calibration gas is toxic, never inhale the gas!

Symptoms: Dizziness, headache and nausea.

Procedure if exposed: Bring into fresh air at once, consult a doctor.

Please observe proper handling procedures for test gas bottles and the regulations according to TRGS 220!

Prior to calibration the sensor element must be powered and fully stabilized for at least 1 hour without interruption. Calibration must only be performed under operation typical ambient conditions.

Always consider the commissioning instructions when exchanging the sensor element.

Only trained technicians should perform the following:

- Check mounting location.
- Check power voltage.
- Calibrate the transmitter (if not factory calibrated).

Required instruments to calibrate the transmitter:

- Test gas bottle with synthetic air or CO-free ambient air.
- Test gas bottle with CO. Concentration 30 – 70 % of the measuring range. The rest is synthetic air.
- Gas pressure regulator with flow meter.
- Calibration adapter with tubing.
- Digital voltmeter with range 0-10 Vdc, accuracy 1%
- Small screwdriver.

### Calibration Zero Point (Output Signal 4 mA)

- Open cover of enclosure.
- Connect digital voltmeter to pin "Test" for zero-point calibration.
- Connect the calibration adapter to the sensor element.
- Apply zero calibration gas, 150 ml/min; 1 Bar (14.5 psi), or other CO-free air source.
- Wait one minute until the signal is stable, adjust signal with potentiometer "Zero" until the signal is  $40 \text{ mV} \pm 1 \text{ mV}$  and stable ( $= 4 \text{ mA} / 2\text{V}$ ).

### Calibration Span

- Connect calibration adapter to the sensor element.
- Connect digital voltmeter to pin "Test".
- Apply span calibration gas (30 – 70 % CO of measuring range), 150 ml/min; 1 Bar (14.5 psi).
- Wait two minutes until the signal is stable, adjust signal with potentiometer "Gain" until the signal corresponds to the calculated value, see calculation for control voltage  $5.3, \pm 1 \text{ mV}$  and is stable.

At a loss of sensitivity of more than 70% caused by ageing, operational or climatic influences, calibration will not be possible any more. Then the sensor has to be replaced.

**Calculation of Control Span Voltage**

The control voltage at the pin "Test" simulates the 4-20 mA signal at a 10 Ohm measuring resistance.

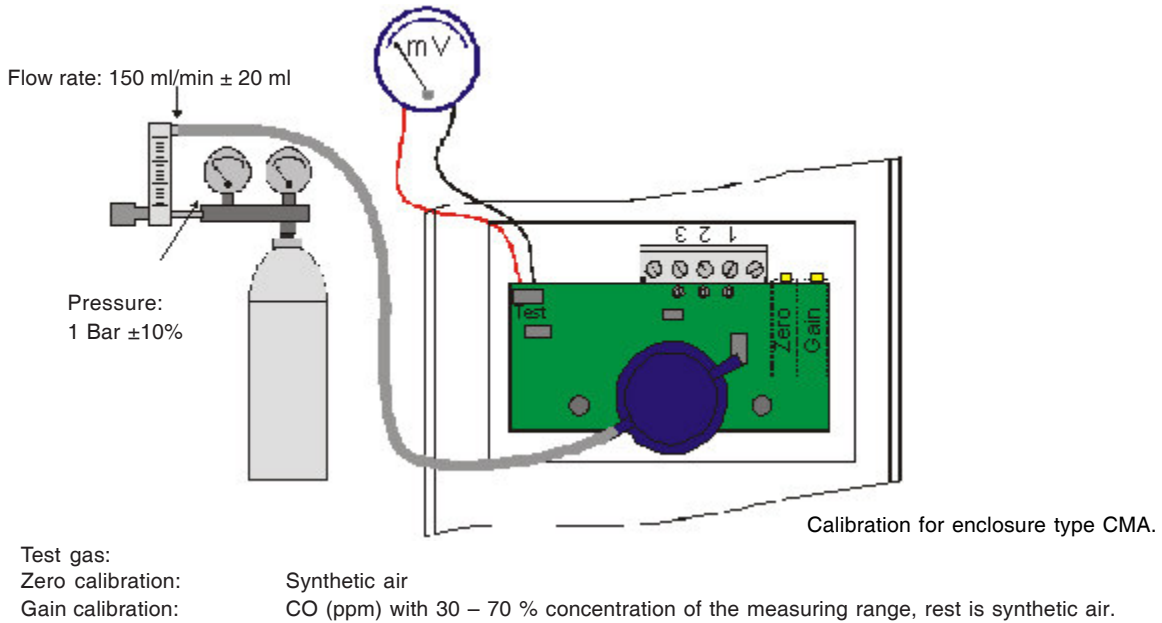
$$\text{Control span voltage (mV)} = \frac{160 \text{ (mV)} \times \text{test gas concentration CO (ppm)}}{\text{measuring range CO (ppm)}} + 40 \text{ (mV)}$$

**Example:**

Measuring range CO	300 ppm
Test gas concentration	200 ppm CO
Control voltage	146,7 mV

$$\frac{160 \text{ (mV)} \times 200 \text{ (ppm)}}{300 \text{ (ppm)}} + 40 \text{ (mV)} = 146,7 \text{ mV}$$

Control voltage:	(mV)
Zero calibration:	40 mV ±2 mV
Gain calibration: =	$\frac{160 \text{ mV} \times \text{CO (ppm)}}{\text{Measuring range (ppm)}} + 40 \text{ mV}$



## Inspection and Service

Inspection, service and calibration of the unit should be done by trained technicians and executed at regular intervals.

According to EN 45544-4, inspection and service has to be executed at regular intervals.

The maximum intervals have to be determined by the person responsible for the gas warning system according to the legal requirements.

VCP recommends checking the unit every three months and maintaining it every 12 months.

If different intervals are indicated, always consider the shortest interval.

Inspections and services must be documented.

The date for the next maintenance has to be affixed to the transmitter.

### Inspection

The CO detector should be controlled regularly by a competent person according to EN 45544-4.

The following has to be checked in particular:

- Maintenance/ calibration interval not exceeded.
- Visual inspection of the transmitter including cable for damage etc.
- Remove dust deposits, especially at the gas inlet.

### Service and Calibration

When performing the maintenance you have to do the calibration and the functional test in addition to the inspection.

- Calibration: See pages 6 and 7.
- Functional test: Check the output signal at the test pins during calibration.

### Exchange of Sensor Element

Sensor should always be exchanged without power applied (remove the socket board):

- Unscrew the two fixing bolts.
- Remove the board with the sensor upwards out of the sensor cup.
- Unplug old sensor element from the PCB, plug in new original sensor element.
- Plug in the PCB with the sensor into sensor cup and tighten it by the screws.
- Plug in the socket board correctly. page 5.
- Calibrate the sensor, See pages pages 7.

## Troubleshooting

### Diagnostics at the Unit

Trouble	Cause	Solution
Output signal 0 mA and control voltage 0 V	Power voltage not applied or not connected correctly.	Measure power voltage at terminal block 1 (+) and 2 (-) (16 – 28 VDC)
	Socket board not plugged in correctly	Plug in the socket board acc. to fig.3.
Output signal < 3 mA and/or control voltage < 30 mV	Transmitter not calibrated	Calibrate transmitter
Control voltage doesn't reach the calculated value	Sensor sensitivity < 30 %	Replace sensor element

If faults cannot be eliminated by the above mentioned actions or if other faults not described in this table occur, please contact the service.

### Cross-sensitivity Data

The table does not claim to be complete.

Other gases can have an influence on the sensitivity, too.

The indicated sensitivity data are only standard values referring to new sensor elements.

Gas	Chemical formula	Gas concentration	Exposure Time (min)	Influence on the reading (ppm CO)
Acetone	$(CH_3)_2CO$	1000 ppm	5	0 ppm
Acetylene	$C_2H_2$	40 ppm	5	80 ppm
Ammonia	$NH_3$	100 ppm	5	0 ppm
Carbon dioxide	$CO_2$	5000 ppm	5	0 ppm
Chlorine	$Cl_2$	2 ppm	5	0 ppm
Ethanol	$C_2H_5OH$	2000 ppm	30	5 ppm
Hydrogen	$H_2$	100 ppm	5	20 ppm
Hydrogen sulphide	$H_2S$	25 ppm	5	0 ppm
Iso Propanol	$C_3H_7OH$	200 ppm	120	0 ppm
Nitric oxide	NO	50 ppm	5	8 ppm
Nitrogen dioxide	$NO_2$	50 ppm	900	1 ppm
Sulphur dioxide	$SO_2$	50 ppm	600	< 0.5 ppm

**Calibration Adaptor****CAL KIT 200**

Calibration kit CAL KIT 200  
for CO detectors CMA and CMK-series.

**Notes and General Information**

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions.

The CO detector must be used within product specification capabilities.

The appropriate operating and maintenance instructions and recommendations must be followed.

Due to on-going product development, Rototech reserves the right to change specifications without notice.

The information contained herein is based upon data considered to be accurate.

However, no guarantee is expressed or implied regarding the accuracy of this data.

**Intended Product Application**

The CO detector are designed and manufactured for control applications and air quality compliance in commercial buildings and manufacturing plants.

**Installers' Responsibilities**

It is the installer's responsibility to ensure that all CO detectors are installed in compliance with all national and local codes and OSHA requirements.

Installation should be implemented only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70). It is also essential to follow strictly all instructions as provided in the user manual.

**Maintenance**

It is recommended to check the CO detector regularly.

Due to regular maintenance any performance deviations may easily be corrected.

Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools.

Alternatively, the easily removable plug-in transmitter card with the sensor may be returned for service to Rototech.

**Limited Warranty**

Rototech warrants the CO detector for a period of one (1) year from the date of shipment against defects in material or workmanship.

Should any evidence of defects in material or workmanship occur during the warranty period, Rototech will repair or replace the product at their own discretion, without charge.

This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise.

The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned.

The above warranty is in lieu of all other express warranties, obligations or liabilities.

This warranty applies only to the CO detector.

Rototech shall not be liable for any incidental or consequential damages arising out of or related to the use of the CO detector

We reserve the right to make changes in our products without any notice which may effect the accuracy of the information contained in this leaflet.